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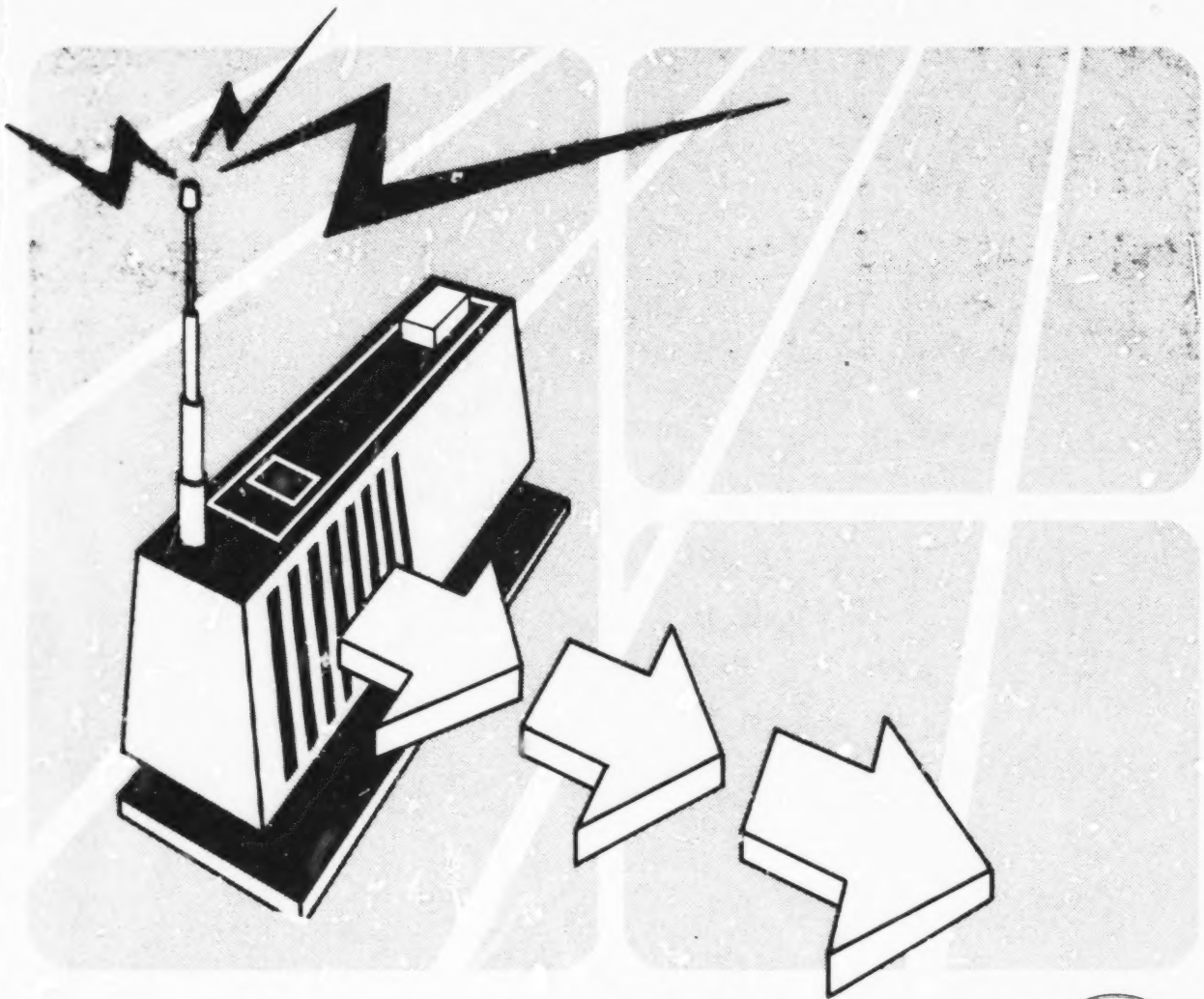
Maintenance Manual
Tone Alert Transmitters and Receivers



COMPLETED

MAINTENANCE MANUAL

TONE ALERT
TRANSMITTERS AND RECEIVERS

Federal Emergency
Management Agency

Maintenance Manual
Tone Alert Transmitters and Receivers

Introduction

The purpose of this manual is to guide you on how to maintain tone alert transmitters and receivers. The information in this manual is only a **supplement** to the recommended maintenance information supplied in the service manuals provided by the manufacturers of the equipment. **Always follow the maintenance procedures provided in the manufacturer's manuals.** This manual will help you understand why maintenance is necessary. This manual will also be helpful if the manufacturer's maintenance manuals are not immediately available.

Description of Tone Alert Transmitters & Receivers

Tone alert transmitters and receivers were designed to provide a degree of privacy to communications carried on normal radio channels.

A typical tone alert transmitter and receiver consists of one or more tone generators, one or more tone receivers and the necessary logic circuits to decode the tone sequence. The system operates by closing the squelch on the receivers to all messages except those coded in the proper tone. Monitoring the tone coded channel is important to reduce noise. The channel is monitored on some equipment by combining tone and noise squelch; other units monitor via a microphone switch.

It is important that tone receivers be protected from false operation. False operation can be caused by one or more of the following:

1) adjacent channel tones
2) intermodulation in simultaneous tone systems
3) noise
4) voice modulation

Most tone-squelch systems operate two-way. The base station usually receives twice as many transmissions as a mobile station. The efficiency of the system decreases as the number of mobile units increases per base station. A large system with a 100 or more mobile units would find little advantage to this means of communication, without modification of the entire array to reduce interference.

Preventive Maintenance

To ensure that your tone alert transmitter and receiver works in an emergency, you should develop a program where you **regularly check the equipment to spot small troubles before they become big problems**. A program of coordinated monthly, semiannual and annual maintenance checks prevent serious problems from suddenly happening.

Routinely clean all the units. Check for frayed connections and loose bolts and parts; inspect the antennas. These checks are not normally mentioned in manufacturer's manuals, but can lead to more serious problems.

Equipment and Spare Parts

Only ordinary mechanical and electrical tools are needed to perform most maintenance on this equipment. You may also need a multimeter and a low signal meter to correct some specific problems.

Maintain a list of spare parts. Solid-state equipment such as these transmitters and receivers will have few user serviceable parts. It may be more cost effective to replace the entire unit rather than try to locate a specific problem within it. The following table gives you an example of a list of spare parts for an agency that owns 100 mobile units.

Spare Parts: Tone Alert Tranmitters & Receivers

Names of parts	Quantity
complete replacement units	4
recommended connectors	10
battery connection sets	5
mounting hardware for sets	4

Safety

Follow safety precautions outlined in maintenance manuals supplied by the manufacturer. The circuits of tone alert transmitters and receivers may contain high levels of voltage that are potentially dangerous. Only a qualified electronics technician should attempt to repair any serious electrical problems.

Monthly Maintenance Checks

1) Clean the radio set.

a) Remove moisture and loose dirt with a clean, soft cloth.

b) Remove grease, fungus, and ground-in dirt from the exterior surface. If dirt is difficult to remove, dampen the cloth with water and use mild soap. Wipe dry with a clean, dry, lint-free cloth.

c) Clean the front panel and controls, using a clean, soft cloth. If dirt is difficult to remove, dampen the cloth with water and use mild soap (if necessary).

2) Check all cables for evidence of chafing, cracking, or excessive strain. Check all electrical connectors for dents, cracks, or improper mating. Check connector cap and fuse caps for security.

3) Inspect the radio set's mounting. Check controls for smooth mechanical action and make sure that all knobs are tight.

6-Month Maintenance Checks

1) Remove rust corrosion from metal surfaces, by sanding lightly with fine sandpaper, not emery paper. Brush two thin coats of paint on the bare metal to protect it from further corrosion.

Corrective Maintenance: Troubleshooting

You may discover some equipment malfunctions during your inspection or use of your transmitter and receiver. Perform the tests on the following table to locate, and possibly correct, the problem.

PLEASE NOTE: This manual does not attempt to list all possible malfunctions that could occur nor can we suggest all possible remedies. Consult the manufacturer's manuals if a malfunction is not listed or it is not corrected by a prescribed procedure.

CORRECTIVE MAINTENANCE:

Tone Alert Transmitters and Receivers (Part 1 of 4)

Malfunction	Possible Cause	Recommendation
1. False operation	■ adjacent chanel tone	■ reduce filter band switch
	■ noise	■ check noise filter
2. Unit does not operate; power light does not glow	■ burned out fuse	■ replace fuse
	■ defective on-off switch	■ if voltage is not present with on/off switch in either position, replace switch
	■ pilot light	■ replace old bulb
	■ open cable	■ check voltage with VOM; if no voltage, check & repair cable
3 Unit does not operate; power light glows	■ short within power circuit	■ if no voltage, replace unit with spare
	■ short within unit	■ use ammeter; if current is higher than rated, replace unit with spare
	■ input voltage polarity reversed	■ check with VOM; if polarity reversed, transpose input leads. If unit does not operate because it has been damaged, replace radio.
4. Radio set does not tune to desired frequency	■ defective radio set	■ remove & replace radio set

Corrective Maintenance:
Tone Alert Transmitters and Receivers (Part 2 of 4)

Malfunction	Possible Cause	Recommendation
5. Unit transmits, but does not receive	■ squelch set too tight	■ adjust squelch control through entire range; disable tone squelch if used. If no noise heard, proceed to next step.
	■ intermodulation of simultaneous tone system	■ select tone frequencies farther apart
	■ noise	■ reduce filter band width
	■ defective rf amplifier tube (if used)	■ try new tube. If operation not restored, replace unit.
	■ defective relay	■ Short antenna & receiver input contacts. If operation restored, burnish & adjust relay contacts.
6. Unit receives but does not transmit	■ PTT switch defective or mike cable open	■ try new mike or short PTT terminals at mike receptacle with test lead. Monitor transmitter output with an rf wattmeter or field strength meter. If operation restored, replace mike with spare or repair PTT switch or mike cable.
	■ defective tube (if tubes used)	■ try new tubes, one at a time. If operation not restored, replace unit with spare.

Corrective Maintenance:
Tone Alert Transmitters and Receivers (Part 3 of 4)

Malfunction	Possible Cause	Recommendation
7. Operator controls do not work properly	■ defective radio set or loose knobs	■ a. check knobs for tightness; tighten or replace as necessary. 1) tighten the set-screws that engage flattened shaft & collar b. remove and radio set if necessary
8. Radio set inoperative	■ primary power circuit breaker or fuse open ■ Electrical connector not properly mated. Radio set defective	■ check primary circuit breaker or fuse, or radio set fuse; reset or replace. Check electrical connection for proper mating. Remove & replace radio set if necessary.
9. Excessive hum heard while receiving	■ radio set defective	■ Remove & replace radio set if necessary
10. Squelch does not operate properly	■ squelch control improperly adjusted. Defective radio set.	■ adjust squelch. remove & replace radio set if necessary.
11. No activation of receiver	■ tone frequency incorrect	■ recalabrate transmitter encoder
	■ defective decoder	■ recalabrate decoder

Corrective Maintenance:
Tone Alert Transmitters and Receivers (Part 4 of 4)

Malfunction	Possible Cause	Recommendation
12. No sidetone heard while receiving. Audio distorted.	■ defective interphone system. Radio defective.	■ check interphone system & cables. Remove & replace radio set if necessary.
13. Radio set will transmit but not receive	■ squelch improperly set. Interphone system defective.	■ adjust squelch. Check interphone system. Remove & replace radio set if necessary.
14. Radio set works on some frequencies but not on others	■ radio set defective	■ remove & replace radio set
15. Reception and transmission very weak.	■ antenna system or radio set defective	■ check antenna cable and connectors at back of radio & at antenna. Replace radio set if necessary.

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